

The Role of Epidemiology in Prevention of Hypertension in Israel

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Synopsis

High blood pressure may be the most important modifiable determinant of severe morbidity and mortality in the adult population in Israel. Because hypertension control can effect a reduction in this morbidity and mortality, programs of secondary—and subsequently primary—prevention can have a far-reaching impact on the state of health in the nation.

HIGH BLOOD PRESSURE may be the most important modifiable determinant of severe morbidity and mortality in the adult population in Israel. Observational and experimental data on the risks of hypertension and the benefits of blood pressure reduction are compelling. Inasmuch as hypertension control can effect a reduction in this morbidity and mortality, programs of secondary—and subsequently primary—prevention can have a far-reaching impact on the state of health in the nation. Additionally, such programs could serve as a focal point for conceptual modification of the functions of primary care and consequently could contribute to the upgrading of primary care in Israel. We subscribe to the notion that hypertension control should be addressed on a national scale by the integration of epidemiology into primary care practice.

Intervention policies in the United States and Israel may differ substantially because of contrasting systems of delivery of health services, the Israeli system being highly centralized and based on prepaid insurance, while the U.S. system still operates predominantly on a fee-for-service basis. This allows for a greater centralized policy-making capacity in Israel, a potential advantage of

The primary care delivery system in Israel is structurally well suited to centrally directed initiatives. Major hypertension control programs are being introduced in Israel. The General Federation of Labour Sick Fund (Kupat Holim)—the nation's chief provider of primary care—has recently undertaken a wide-scale initiative for detection and treatment of high blood pressure in its neighborhood primary care clinics. A policy decision has thus been made on a national level; resources for intervention have been made available and activities initiated. The issue in need of resolution, the authors believe, is that of the integration of rigorous epidemiologic methodology into the planning and execution of the programs, particularly in program evaluation and resultant program modification.

The authors outline selected epidemiologic characteristics of hypertension in Israel, emphasizing the major role that elevated blood pressure plays as a determinant of mortality; the present status of hypertension control; current programs for control; and the role of epidemiology in preventive programs.

the Israeli primary curative care delivery network that is now only beginning to be tapped.

Major programs are currently being introduced in Israel. The chief provider of primary care in the nation, the General Federation of Labour Sick Fund (Kupat Holim), has recently undertaken a wide-scale program for the detection and treatment of high blood pressure in its neighborhood primary care clinics. A policy decision has thus been made on a national level in an appropriate setting; resources for intervention have been made available and activities initiated. The issue clearly in need of resolution is that of the integration of rigorous epidemiologic methodology into the planning and execution of the programs, particularly in program evaluation and resultant program modification. Here, thought and investment are required, and government participation and support may be necessary.

This paper briefly outlines selected characteristics of the epidemiology of hypertension in Israel, emphasizing the major role that elevated blood pressure plays as a determinant of mortality; the present status of hypertension control in Israel; current programs for control; and the role of epidemiology in prevention programs.

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The Case for Intervention in Israel

Over the past decade, sharp declines in total mortality, in coronary heart disease (CHD) mortality, and in cerebrovascular mortality have occurred in both Israel (1,2) and the United States (3). There is little unambiguous evidence in Israel of a reduction in risk factors commensurate with the reduction in mortality (4). The issue of whether the reduction in CHD mortality and total mortality in Israel reflects risk factor reduction and reduced incidence of disease or reduced case fatality remains open.

The patterns in Israel of blood pressure variation with age on cross-sectional study reflect those seen in urbanized societies. Three large population-based surveys—the Israel Ischemic Heart Disease Study (IIHDS) of male civil servants in 1963 (5), the Jerusalem Kiryat Hayovel Community Health Study between 1969–71 (6,7), and a nationwide probability sample ascertained between 1969 and 1972 (8)—showed generally similar age associations. Mean levels of blood pressure and categorically defined hypertension were highly similar in the Kiryat Hayovel study and the U.S. National Health and Nutrition Examination Survey (NHANES) (9), 1971–75. Data from these two surveys are comparable despite some protocol differences.

The Lipid Research Clinic (LRC) Study Program, which used a standard protocol for data collection, including blood pressure measurement, in surveys in the United States, Canada, the Soviet Union, and Israel, permits a methodologically unbiased comparison. The Israeli clinic, located in Jerusalem, examined a population sample of 17-year olds and their parents living in the city (10). The age-adjusted prevalence of high blood pressure (defined here as diastolic blood pressure \geq 95 mm Hg, or current use of antihypertensive medication) in the Jerusalem clinic between 1976 and 1979 and in the U.S. clinics between 1971 and 1975 was almost identical for persons between the ages of 40 and 59: among men, 14 percent in Jerusalem versus 15 percent in the United States; among women, 12 percent in the study populations of both countries (U.S.-Israel Collaborative LRC Study, preliminary data). These comparisons indicate that blood pressure levels, including those categorically

defined as hypertension, are similarly distributed in the two countries and that the extent of the problem is of a similar order of magnitude.

The four above-mentioned studies in Israel have also reported data on hypertension control. In 1963, 40 percent of men classified as hypertensive in the IIHDS were aware of their condition, about half of them were being treated, and less than 50 percent of those being treated were controlled (11). It thus appears that only 10 percent of hypertensives were receiving adequate care. The situation in the United States in the early 1960s was similar (12).

Two longitudinal studies in Israel show considerable improvement in treatment status during the 1970s (13, 14). These were, however, closed cohorts; dissemination of blood pressure findings at baseline to participants or to treating physicians may have contributed to these trends. We are unaware of sequential, comparable, independent population-based samples in Israel in the last decade that permit estimates of change unaffected by study interventions. The need is obvious.

The Hypertension Detection and Follow-Up Program survey of 14 communities in the United States in 1973–74 showed that although the proportions of patients who were aware of their hypertension, were under treatment, and were controlled were each 70 percent or more, only 38 percent of all hypertensives were controlled (15).

The LRC program permits a comparison of the extent of hypertension therapy and its effectiveness in Jerusalem for the period 1976–79 with that in the U.S. clinics for the period 1971–75 (U.S.-Israel Collaborative LRC Study, preliminary data). Although the examinations in Jerusalem were performed 5 years later than those in the United States—a period in which substantial change occurred in blood pressure management in that country—the age-adjusted proportion of U.S. hypertensives treated was equal to or slightly greater than that of Israeli hypertensives (among men, 42 percent in the U.S. study population versus 39 percent in Jerusalem; among women, 63 percent in the United States versus 55 percent in Jerusalem). Control of hypertension (age-adjusted proportion with diastolic blood pressure $<$ 95 mm Hg among hypertensives) was, however, seemingly better in the U.S. clinics than in Jerusalem, and twofold better among women than among men in both countries (among men, 26 percent of hypertensives in the U.S. study population were controlled versus 19 percent in Jerusalem; among women, 52 percent in the U.S. clinics were controlled versus 37 percent in Jerusalem). The apparently poorer control of hypertension in Jerusalem may be reflected in the nearly 50 percent greater prevalence of high R waves on electrocardiograms among the Jerusalem LRC population. Thus, the potential advan-

tage inherent in the organization of the Israeli primary care network was clearly not yet being realized.

In a community-based study in Jerusalem, systolic blood pressure was a stronger predictor of 10-year cardiovascular and total mortality in men and women aged 35 years or more than was diastolic blood pressure. Both systolic and diastolic blood pressure predicted mortality more strongly in women than in men (16). The population impact of hypertension in terms of prediction of mortality was assessed in two cohorts in Israel. In the IIHD study, a male occupational cohort, the proportion of all 5-year mortality attributable to hypertension (the population attributable risk percent) was 22.5 percent (90 percent confidence interval 16 percent to 29 percent) (4). In the Kiryat Hayovel Community Health Study, among participants aged 35 and older, the proportion of deaths attributable to hypertension (systolic blood pressure \geq 160 or diastolic blood pressure \geq 95, or both) over a 10-year followup period was considerable, with an overall age-weighted proportion of 19 percent among men and 36 percent among women (4). Thus, in Israel, elevated blood pressure is an important predictor of death. The proportion of mortality attributable to high blood pressure is similar in the United States (17).

Populations at high risk for hypertension, as defined by racial or ethnic group, social class, or education, are not consistent between the two countries. In contrast to the striking differences between U.S. blacks and whites (9,17) and the inverse associations noted with education and measures of social class or socioeconomic status (mainly occupation and income), the picture in Israel seems quite different. The relatively disadvantaged ethnic and social class groupings in Israel do not show higher blood pressure levels in the majority of population-based studies, whether of prevalence or incidence (4).

On the basis of epidemiologic evidence gathered largely in the United States, it has been suggested that modification of psychosocial factors, including poverty and low education, may offer potential for primary prevention (17).

While modification of social and economic disadvantage in Israel is obviously desirable for a multitude of reasons (and is a stated high-priority government policy goal), it is unclear whether such modification is of potential value for primary prevention of hypertension. However, although hypertension is seemingly not related to social class, education, or ethnic group in Israel in the same clear way as in the United States, mortality from stroke is highest among Israelis of North African origin, particularly among women, while for coronary heart disease, North African women have the highest mortality rates and North African men among the highest (1). Should social factors be causally associated with these

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patterns, successful social intervention could bring substantial morbidity and mortality benefits.

Intervention

The benefits of treating moderate and severe hypertension, in terms of reduced morbidity and mortality from cardiovascular disease and especially cerebrovascular disease, have been established (18,19). An apparently beneficial effect of drug treatment for mild hypertension has been demonstrated in two large trials (20,21), though the issue of drug treatment for patients in the 90–104 mm Hg range of diastolic blood pressure remains contentious (22,23).

In Israel, research into lifestyle modification and feasible nondrug therapy for the management of hypertension—particularly mild hypertension—and for the primary prevention of hypertension is a high-priority need. It is unclear to what extent this can supplant widescale use of medication which appears necessary at present, though unappealing. Weight control, though difficult to achieve and maintain, offers a challenging alternative. A clinical trial in Israel showed a potent effect of weight reduction on blood pressure (24). Within the framework of a controlled community intervention (primary and secondary prevention) in Jerusalem (R. Gofin and co-workers, "Psychosocial Factors, Behavior and Blood Pressure Change," manuscript submitted for publication), weight change during a 5-year followup was shown to be the major determinant of blood pressure change in both the intervention and control groups. Control of weight and weight gain may potentially prevent as much as 50 percent of hypertension incidence, as estimated from the Evans County study over a 7-year followup (25). Studies of sodium, potassium, calcium, and magnesium intake; of dietary fat; and of relaxation techniques suggest exciting potential for intervention, both primary and secondary.

It seems logical that hypertension control programs in Israel should utilize the special characteristics of the

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Israeli primary care system, in which about 95 percent of the population is covered by prepaid insurance schemes. These programs should, we believe, evolve through three cumulative stages: (a) case-finding and management among clinic attendees; (b) worksite screening in industry and in the service sector, with referral to the usual primary care providers (with followup at the worksite); and (c) community-oriented primary care. The stages are determined largely by the resources available and training needed, with stage three requiring conceptual modification of the functions of primary care. Evaluation at all stages requires considerable epidemiologic effort.

Stage one. The first stage is that of routine blood pressure measurement in attendees of regular primary care clinics, recognition of hypertensives, and management and followup of identified hypertensives. Such a program has been introduced by Silverberg and coworkers in about 500 of the 1,250 primary care clinics of Kupat Holim, which serve about 80 percent of the population of Israel (26). Each clinic has a defined list of persons eligible for care.

A prerequisite for this approach is sufficiently frequent clinic attendance by a high proportion of the population. Clinic usage in Israel is considered high when measured by the average number of visits per person. A blood pressure study in the Negev region showed that 85 percent of the population aged 30 or older had visited their clinic within the preceding 5 years (27). Surveys are required in other areas to measure attendance and to characterize users and nonusers. For example, young working males may be heavily underrepresented.

The immediate advantages of this approach are its ready, countrywide application to the majority of the population by way of central decisionmaking in Kupat Holim, requirement of few additional resources, and limited need for additional training of care providers (physician-nurse teams). A cost-effectiveness model constructed around the U.S. system of care suggests that adequate control of identified hypertensives is more cost-

effective than extensive screening (28). As a first-stage goal, this clinic-based approach, providing for case finding and adequate followup and control, seems appropriate.

Evaluation components, in terms of both program review and program trials (29), were apparently not built into the Kupat Holim intervention program at its inception. Program review, consisting of both multistage process and outcome evaluation (including morbidity and mortality), needs to be integrated as a systematic and organic part of this intervention. Steps are being taken in this direction. These include development of a central registry of hypertensives with followup data. The ability to randomize numerous clinics offers exciting opportunities for program trials. An interesting example of this design is the Negev trial assessing the level of specialist consultation and participation necessary for optimal program functioning. Twenty-seven Kupat Holim clinics were randomized to three different levels of specialist guidance. Outcome is being evaluated by before-and-after sample surveys of blood pressure and its control in the communities served by the trial clinics (27).

Stage two. This stage includes programs for worksite screening and referral to regular primary care, with followup at the worksite. This would augment and complement the clinic case-finding of stage one and is intended to detect and refer for care hypertensives who rarely, if ever, use their neighborhood primary care clinics and to encourage therapeutic adherence in others. The worksite followup component has been shown to be crucial for maintenance of adequate control, irrespective of whether treatment is administered at the worksite or at referral clinics (30). Kupat Holim also provides an industrial health service and could play an important role in such a program.

For this stage, relatively little investment is required, although restructuring would be necessary. The amount of emphasis to be placed on this stage would be determined largely by the prevalence of uncontrolled hypertension detected in surveys of these working populations. Initial steps in such a program were begun in Israel in 1982 (31). Details of the program, especially those concerning provision for evaluation, remain to be described.

Stage three. The third stage, that of community-oriented primary care (COPC) (32) with components for secondary and primary prevention of hypertension, will require training of medical teams in COPC (clinic workers, worksite health teams, school health providers) and alteration of medical school and nursing school curricula in Israel. The Beer Sheva Medical School is attempting to move in this direction. Research and demonstration health centers, such as the Hadassah Kiryat

Hayovel Center in Jerusalem, need to develop systems and model programs that can feasibly be adopted by routine primary care clinics. Details and examples of this approach, in which the discipline of epidemiology is interwoven into primary care and the objective of the health service is redefined to include the health of the community rather than being limited to treatment of the individual or individual family, have been presented elsewhere (32,33). The CHAD (Community Syndrome of Hypertension, Atherosclerosis, and Diabetes) Program of Kiryat Hayovel, with its blood pressure control component, is an example of such a model (34). Program trials of the COPC approach by random allocation of clinics should be considered.

All three stages require process and outcome evaluation. Achievement of intermediate goals, such as detection of hypertension, treatment, and control, can be assessed relatively easily. Reduction of morbidity and mortality must be viewed as the major program objectives; yet adequately controlled evaluation of these outcomes requires concurrent comparable control groups usually absent in programs. The issue is complicated by the trend toward decline in total and cardiovascular mortality in Israel. Evaluation by time series studies will require particular caution in interpretation.

Although some of the data sources necessary for evaluation are routinely available in Israel, important components are currently lacking. Israel has an accessible national population registry that serves also as a death registry. All death certificates are centrally coded according to standardized nosological classification by the Central Bureau of Statistics. Data can be linked via the personal identification number allocated to each individual person. Although Israel has a national cancer registry accessible by the same key, there is no comparable myocardial infarction registry. A hospital- and death-certificate-based stroke registry is being built up but is incomplete at present. Hospitalization diagnoses, coded according to the International Classification of Diseases, can be accessed through linkage with the personal identification number. However, diagnostic information on individuals for all hospitalizations in the country is not presently available and accessible from one central agency (as in Finland, for example). There is no ongoing population sample health survey in Israel, similar to that of the National Center for Health Statistics in the United States, that could provide periodic population data on blood pressure levels, determinants, treatment status, and adequacy of control. Standardized, repeated sample surveys are badly needed.

Such data systems are central for evaluation of program outcomes on a regional or national scale and should be a high-priority requirement if hypertension prevention

in Israel is to be adequately assessed. Routinely collected data, properly standardized and accessibly stored, would represent a national resource of immense value.

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Prevention of Measles in Israel: Implications of a Long-Term Partial Immunization Program

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Synopsis

Following the introduction of routine measles immunization in Israel in 1967, rapid and persistent modifications in the pattern of the disease were observed, including much more limited and more widely spaced epidemics, a change in the age distribution of measles

cases, and a progressively increasing herd immunity that was estimated, following the 1982 epidemic, at 91.6 percent for the first 26 generations.

This pattern supports the expectation that measles can be eliminated in Israel provided a herd immunity ≥ 94 percent can be achieved before the next epidemic, which is predicted for 1988–89. A logistic approach to the elimination of measles in Israel requires (a) maintenance of an immunization rate of at least 90 percent in each newborn generation; (b) identification and immunization of still susceptible children in the 1–5 year and 6–9 year age groups, to attain vaccination coverage for at least 97 percent of this population (which should result in immunity among at least 94 percent); (c) provision of similar coverage for older, susceptible individuals in selected groups of children, adolescents, and young adults at high risk; (d) disease surveillance based on an early identification of the main sources of infection and monitoring of the active foci of disease in the neighbouring territories, which are an important potential source of the introduction of infection.